Analysis of micro and macro economic factors for household debt : The case of Korea

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Abstract

The purposes of this study are to exam the factors of household debt increase in Korea in the 2000s with the macro economical factors, and also to analyze it by using Korean Labor and Income Panel Study (KLIPS), which comprises household data from 1998, with a view of micro economy. According to result, there were certain environmental factors including the low interest rate, financial deregulation, and constant increase in real estate prices, which led to the rapid increase in household debt in South Korea in the 2000s. Categorizing by characteristics and tasks, a microeconomic analysis considering the characteristics of individual households found that real assets such as real estate had a strong effect on the possession an scale of debt. Moreover, the proxy variables for human capital, which were level for education and expenses for education, positively influenced the possession of debt.

Keywords: Asset portfolio, Environmental factor, Household debt, KLIPS, Life-cycle hypothesis, LTV, Social statistics.

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1. Introduction

At the end of 2008, household credit in South Korea hit a historical high registering 67.2% of GDP. This represents an increase of 29.3 percentages points over the 37.9% marked in 1998, right after the Asian Currency Crisis. Total household debt to GDP also recorded 87.6%, a figure higher than the OECD average of 64.4%.[1)]

Household debt is also rising rapidly. It grew by 20~30% annually between 2000-2002 and slowed between 2003-2004, but from 2004 it has still registered an average annual increase of 10%.

What factors are behind the more rapid increases of household credit and financial debt (8-10%) than GDP (4-6%)?

Research on household debt can be carried out from the perspective of the micro and macro economy. First, the macro-economic approach in general focuses on quantitative analysis of the relationship between changes in the financial environment, such as changes in the interest rate, financial deregulation, etc., institutional factors and increasing of debt.

According to Debelle (2004), the main factor behind the rapid increase in household debt compared to the GDP growth rate in developed countries is the increase of loan to value(LTV), and he also points out that the reason for

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the increase of loan to value involve changes in the tax system, competition between financial institutions and low interest rates. Moreover, Crock and Hochguertel (2007) who note the differences in household debt level between countries, argue that social security instability and low personal bankruptcy related transaction costs tend to boost the demand for debt and that the improvement of mortgage systems, and the financial information sharing system influenced the demand for household loans. Another macro- economic factor is the increase of asset prices.

The macro-economic factors that have been mentioned are common environmental factors related to the demand for household debt. However, even within the same environment, there are differences in debt possession and scale among households.

There have been several researches done as the attempts to supplement the mentioned problem above that are introduction of the social statistics factor of individual household with the micro economical approach. They were Crook & Hochguertel (2007) who studied OECD countries, and Karasulu (2008) and Yoo Kyung-won(2009) who studied Korean households.

These researches find that the debt level was influenced by present income, total asset, level of education, house owning or not, size of household, etc..

However, these studies did not consider the discontinuity of the household statistical data, nor the macro economical factors. According to life-cycle income hypothesis, household debt occurs during the process of utility maximization through the life-cycle and it is also strongly influenced by the characteristics of individual household and macro economical factor.

Therefore, the purposes of this study are to exam the factors of household debt increase in Korea in the 2000s with the macro economical factors, and also to analyze it by using Korean Labor and Income Panel Study (KLIPS), which comprises household data from 1998, with a view of micro economy.

The rest of the article is structured as follows. In Chapter 2, we examine the distribution status of household debt by analyzing the financial affairs status in terms of income level. In Chapter 3, we examine the relationship between macro economic factors in the 2000s and the increase of household debt, as well as the relationship between the asset portfolio of household and social and income factors from a micro-economic view. In Chapter 4, we establish a model based on a dummy of debt existence and non-existence and its scale as a dependent variable to analyze the relationship with each variable in chapter 3. Finally, we categorize the characteristics and tasks based on the result.

2. Household debt Status

In this chapter, we overview and analyze the characteristics of household debt according to income level using KLIPS. KLIPS is a form of data that was collected as an annual investigation of 5,000 representative non-rural households and their members from 1998 in South Korea. In this study, we chose to analyze the most recently released data from 2007 (released in October 2008).

Distribution of household debt

From the 2007 KLIPS data, we chose for our analysis 4,818 households that did not have uncertainty such as omissions of data. Among them, 46.74% had debts.

Looking by income level, in the 4th and 5th deciles with higher income status, 58.4% and 57.26% of households had debts, and in the 1st and 2nd deciles, with lower income levels, 27.55% and, 41.60% had debts. Thus, it can be concluded that the higher the income status, the greater the percentage of households with debts.

Table 1. Asset and debt status of households in terms of income level (2007)

Unit: 10,000 won, %, times

	1st decile	2nd decile	3rd decile	4th decile	5th decile	Total
Total number of households	962	964	964	964	964	4,818
Number of households with debt	265	401	471	563	552	2,252
Ratio of households with debt (%)	27.55	41.6	48.86	58.4	57.26	46.74
Total asset (A)	5,149	8,282	12,932	23,809	51,587	20,358
Total asset ratio (%)	5.05	8.14	12.71	23.4	50.7	100
Financial asset (F)	142	245	532	1,387	3,483	1,206
Residence	3,561	5,185	8,101	14,048	25,857	11,168
Real estate excluding residence	617	1,968	3,136	6,821	19,867	6,462
Key money and Monthly rent deposit	829	884	1,163	1,553	2,380	1,516
Financial asset ratio (%)	2.76	2.96	4.11	5.83	6.75	5.92
Real estate asset ratio (%)	81.14	86.36	86.89	87.65	88.64	86.6
Key money and Monthly rent deposit (%)	16.1	10.67	8.99	6.52	4.61	7.45
Total debt (D)	2,154	2,497	3,802	4,600	9,415	4,951
Total debt ratio (%)	5.12	8.98	16.06	23.23	46.61	100
Financial debt (B)	1,658	2,170	3,320	4,312	8,677	4,499
Financial debt ratio (%)	76.97	86.9	87.34	93.74	92.17	90.88
DTA (D/A)	0.42	0.3	0.29	0.19	0.18	0.24
DTA1 (D/F)	15.17	10.19	7.15	3.32	2.7	4.11
DTA2 (B/F)	1167.61	885.65	624.13	310.91	249.13	373.13

Source: KLIPS (Korean Labor and Income Panel Study, 2007)

Asset and scale of debt of indebted household

The average total assets of indebted households was 20,358,0000 won, and they held an average of 4,951,0000 won in debts. Households in the 5th decile held 50.70% of the total assets, and combined with the 23.40% held by those in the 4th decile, higher income households possessed 74.1% of the total assets.

Households in the 5th decile and 4th decile held 46.61% and 23.23% of the total debt, respectively, for a combined total of 69.84%, showing that both assets and debts concentrated into households with high income levels.

Looking at the characteristics of asset portfolios, financial assets such as stocks and bonds are held by only 5.92% of households, while 86.60% hold

real estate assets. This is much higher than the figures in the United States (25%) and United Kingdom (35%).

The percentage of real estate assets is about 80% in all income levels, with only minor differences. This means that the asset is formed mainly with real estate.

Capability to debt loading and access to financial institution

DTA (debt to assets), an index used to gauge the debt loads of households, is 24% for the entire group. Households it the 5th decile have a relatively low ratio of 18%, while those in the low-income 1st decile have a ratio of 42%. Moreover, the average value of DTA1 (total debt/financial assets), an index of the risk of households to changes in interest rates and the financial environment, is 4.11. By income level, the level if 2.70 for the 5th decile. 15.17 for the 1st decile, and 10.19 for the 2nd decile, meaning that low-income households are more vulnerable to macro- economic changes such as a rise in the interest rate.

This can also be seen from the ratio of financial debt to financial assets. The overall financial debt ratio is a high 373.13. The 249.13 times of the 5th decile is lower than the average and the 1st decile has a ratio of 1167.61, meaning that the ratio higher among lower income levels. It also means that lower income households are vulnerable in terms of ability to respond to changes in the financial environment.

In terms of access to financial institutions, households in the 5th decile owe an average of 8,677,0000 won, comprising 92.17% of their entire debt, to financial institutions. For households in the 1st decile, the figure is 1,658,0000 won, making up 76.97% of the total debt. With the remaining 23.03% supplied by private means. Thus, it can be inferred that there is a difference in access to financial institutions according to the income level.

Scale of assets and debt according to the age of householder

To examine the characteristics of different age groups, respondents were divided into five different age groups.

Table 2. Scale of assets and debt according to the age of householder (2007)

Unit: 10,000 won, %, times

	Below 34 years old	35-44 years old	45-54 years old	55-64 years old	Above 65 years old	Total
Households with debt (%)	44.76	60.31	58.58	48.12	21.92	46.74
Total asset (A)	11,359	18,975	26,024	29,343	16,089	20,358
Financial asset (F)	1,357	1,374	1,357	1,508	432	1,206
Total debt (D)	3,803	5,269	5,997	6,293	3,393	4,951
DTA (D/A)	0.33	0.28	0.23	0.21	0.21	0.24
DTA1 (D/F)	2.8	3.83	4.42	4.17	7.85	4.11

Source: BOK, Economic Statistics System ECOS.

Total assets were largest in the 55-64 years old group, at 29,343,0000 won. Financial assets were also highest in the same group, at 1,508,0000 won, and were similar in all other groups except for the 432,0000 won in the group above 65.

Those in the 35-44 years old group had the highest debt, at 60.31% with the figure being much lower, at 20.6%, in the group above 65. The scale of debts increased constantly until the 55-64 years old group and then rapidly decreased in the above 65 group.

This increase in debt seems to be closely related to the asset formation structure of Korean households and to expenses for education. For general households, asset formation begins when the householder is in his or mid thirties, and includes, for example, purchasing a house. Education expenses begin in earnest at that age. Mortgages and others factors seem to lead to the debt increase.

According to the life-cycle income hypothesis (Hall, 1978), household

debt begins during the initial life-cycle period when the income is the lowest throughout the entire life, and the age of the householder to debt demand shows an inverse U shape. Therefore, the peak age should theoretically fall at the beginning of the life time, or in other words, at a young age. In fact, the peak is different in countries. In Korea, the debt increases rapidly from the mid-30s, but the peak point actually appears in the 55-64 year-old group, contradicting the life-cycle income hypothesis.

3. Factors determining household debt

3.1 Macro-economic factors

Changes in the financial environment and rising home prices are the major macro- economic factors behind the increase in the demand for household debt. In this chapter, those two environmental factors are examined in terms of supply and demand.

Changes in the financial environment

After 1998, household credit in South Korea increased rapidly. During this process, the percentage of bank loans to household for the purpose of purchasing homes increased from 26.42% in 1998 to 45.25% in 2007(Table 3). 2)

Table 3. Household credit and household loan from the bank (1998-2008)

Unit: Billion won, %

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Household credit/GDP	37.9	40.4	44.2	52.5	60.9	58.3	57.4	60.3	64	64.7	67.2
Bank loans (A)	200,289	250,240	310,804	357,384	471,684	538,261	565,655	613,923	699,430	803,724	917,110
Household loans from bank (B)	52,914	76,315	107,235	156,712	222,017	253,757	276,327	305,514	346,222	363,681	388,573
B/A	26.42	30.5	34.5	43.85	47.07	47.14	48.85	49.76	49.5	45.25	42.37

Source: see Table 2.

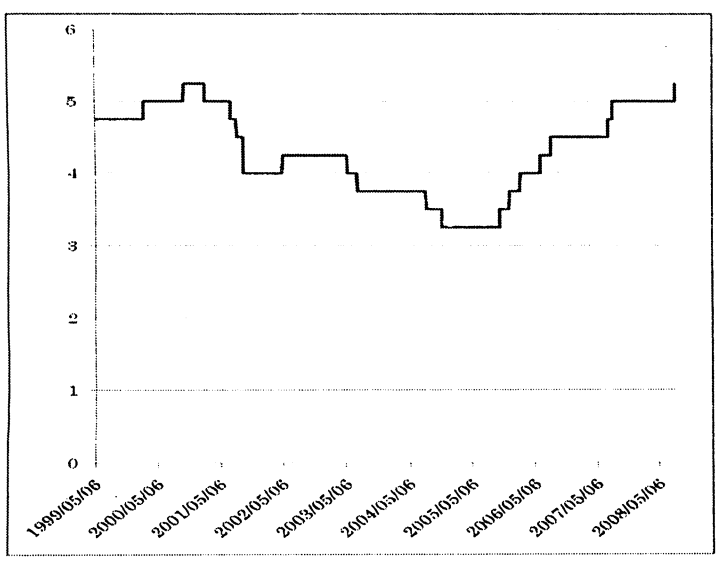
As a supply factor, changes in the financial environment mainly led to an increase in household debt. After the foreign currency crisis of 1997, drastic financial deregulation and economic opening intensified the asset-scale expand competition of Financial Institutions. In addition, regulation on financial soundness were strengthened and; as a result, financial institutions expanded relatively low-risk-household loans compared to business loans.

Low interest rate and price increases of real estate

From households' point of view as users, the financial deregulation invigorated consumer credit giving household's increased access to financial institutions. Moreover, as the government's low interest rate policy continued, the demand for household debt was further stimulated.

The standard interest rate of the Bank of Korea hit a peak of 5.25% in October 2000, and then continued falling hitting 3.25% in October 2005. In spite of several boosts, it only recovered to 5.25% in August 2008.

Fig. 1. Bank of Korea Base Rate (%)



Source: see Table 2.

As the government's loose monetary policy continues, the interest on household loans fell from 9.88% in 2004 to 6.48% in 2007. Regarding this progress, there was a reversal of business and household interest reversal (2004) (Table 4).

Table 4. Household loan interest status (1998-2007)

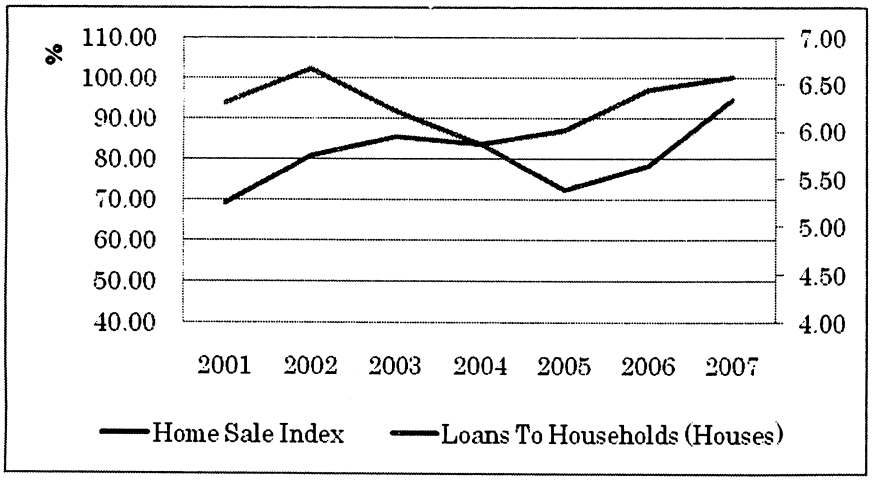
Unit: annual %

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Loans & Discounts	15.18	9.40	8.55	7.70	6.70	6.24	5.90	5.59	5.99	6.55
Loans To Corporations	15.20	8.91	8.18	7.49	6.50	6.17	5.92	5.65	6.08	6.60
Loans To Households	15.21	10.85	9.88	8.20	6.92	6.50	5.88	5.49	5.80	6.48
Loans To Households (Houses)				6.31	6.67	6.21	5.86	5.39	5.64	6.34

Source: see Table 2.

In addition, real estate prices constantly increased. Between 1988 and 2007, the sale price index of real estate recorded an upward tendency of 64.7%. In particular, apartment prices rose by 109.5%.

Fig. 2. Home Sale Index and Loans to Households (Houses)



Source: Loan to value and interest are from the Economic Statistics System ECOS of the Bank of Korea, home sale index from the National Statistic Office.

Notes: Home sale Index is from December 2007, Annually from December.

The fall in the interest rate reduced the burden on households, and rising home prices enhanced their value as collateral and expanded the line of credit stimulating the demand for household loan. This contributed to the increase in household debts.

This phenomenon was also identified by the Granger-Causality Test that verified the causality toward household loans, of home prices and interest on loans. The fall in interest rates led to an increase in household loans from the 2nd and 3rd quarter of the year, with a time, while the home price led to an almost immediate increase in household loans (Lee Gye-hwa, 2005).

3.2 Micro economic Factors

(1)Asset portfolios

According to Carrol (2001), Campbell & Mankiw (1989, 1990) and others, when there is a discontinuity in a factor such as income, expense, or length of life, the households tend to save more, with a precautionary motive, leading to a reduction in household debts.

However, the effects on debt can differ depending on the asset portfolio because the increase in debt results in asset appreciation, which means that household debts can be determined simultaneously with assets (Yoo Kyung-Won 2008).

If the household asset is a real asset rather than a financial asset, and the ratio is very high, this can lead to the appreciation of household debts. Since the real asset functions as collateral, a lower interest rate can be used. Moreover, if the interest rate remains low and the price of the real asset increases, on top of the interest rate inducement, there is an expansion effect on the collateral limit due to the real asset price appreciation which enhances the household debt inducement.

Furthermore, the constant increase in the price of the real asset can stimulate the demand for loans through the effect of psychological

expectations, leading to the conclusion that the asset portfolio influences household debts. Therefore, real estate assets have a positive effect on the existence or non-existence of debts as well as their scale.

(2)Social statistics

In considering the characteristics of individual households, social statistics factors can also be examined as a factor. Such statistics include human capital, age of the householder, number of members of the household, and employment status of the members, as indicated by Campbell (2006).

Education level of householder: Even when the present income of the household is low, the household may expect to make up for the deficit if the income level increases based on the utilization of human capital. When the householder has qualifications or a high education level, expectations for future income can be increased. Moreover, investment opportunities and risk hedging due to the improvement of access to complex financial instruments are also expected.

Therefore, as a proxy variable for human capital, the education level and educational expenses positively influence future income, and they function as a factor for the appreciation of debt demand.

Age of the householder: As the householder gets older, there are more chances to increase the debt due to asset formation and education for children etc. As seen above, the factors favoring an increase in debt in South Korea increase starting during the householder's mid-30s due to the demand for asset formation and education for children. Therefore, the age of the householder can be said to positively influence the demand for debt.

(3)Income level

The income level can be reflected in the scale of debts. As examined

above, in the case of Korea, there is a huge gap in the asset portfolio between the different income levels. In particular, there is a difference in the scale of real estate assets, which can be used as collateral.

Although households can access the credit market thanks to changes in the financial environment, the benefits of the changes may be much lower for low- income level households compared to those with high income levels. This can be easily inferred from the fact that the ratio of households in the 1st decile with debt is only 27.55%, a much lower figure than the 57.26% in the 5th decile. In addition, the financial debt ratio is 15.2% for households in the 1st decile versus 92.17% for those in the 5th decile. Therefore, it can be inferred that households with high income levels have a stronger tendency to possess debts and have larger scale debt compared to house with low income levels.

4. Model analysis

4.1 Selection of data and variables

Among Korean Labor and Income Panel Study (1988-2007) surveyed by the Korea Labor Institute from 1998, the data from 2002 to 2007 are analyzed considering the continuity of the data.

For independent variables, (1)a dummy variable indicating the existence or non existence of debt possession and, (2) an independent variable for the scale of debt are considered.

The explanatory variables consist of three types of factors. (1)Asset portfolio factors: real estate assets, financial assets; (2)social statistics factors: age of householder, years of education, number of members(number of employed members), employment status(paid labor, entrepreneur,

unemployed); and (3)income status: income level.

For real estate assets and financial assets, which are factors that affect the asset portfolio, the previous value of 1 period is used in order to overcome the problem of endogeneity, which arises, when they are determined simultaneously with debt possession.

4.2 Selection of model and analysis method

For the analysis, we use a panel model. The panel model reflects the characteristics of the individual households that are not surveyed compared to cross-sectional analysis and time-series analysis, providing the advantage of making dynamic analysis possible. The basic formula of the model is as follows:

$$y_{it} = \alpha x_{it} + \beta x_{it} + \eta_i + \epsilon_{it} \qquad (1)$$

y_{it} , αx_{it} , βx_{it} , ϵ_{it} are dependent variables, representing the characteristics of asset portfolio, characteristics of social statistics, vector and error term indicating income characteristics, respectively. And η_i shows the household characteristics that influence the determination of household debt which is not observed.

The deduction of the panel model can be categorized as a Pooled OLS, Fixed Effect model and Random Effect model according to the handling method of η_i. In this analysis, we use a random effect model which handles household characteristic η_i which is not observed, as a dependent random variable with household characteristics x_{it}..[3)]

From the formula (1), when the existence and non existence of debt are dependent variables, it can be inferred as a panel probit model, and if the scale of debt is a dependent variable, it can be inferred as a panel tobit model because it does not have a negative value.

4.3 Estimated Results

1) Factor determination the existence or non-existence of debt

Asset portfolio

The relation between real estate assets and debt possession shows that the higher the value of the real estate assets, the higher the likelihood that a household will have debts. This is consistent with the results of the cross-sectional analysis. From this, we can confirm that the demand for household debt has a close relationship with the formation of real estate assets.

Social statistics

Years of education and expenses on education also have a positive influence on the likelihood of debt possession. This can be inferred as signifying that the higher the standard of human capital, the higher the potential future income. This is also consistent with the life-cycle income hypothesis.

It was confirmed that as the number of households increased, the probability of debt possession rose. It can be interpreted as meaning that the larger the household scale, the higher the consumption level. In addition, the larger the number of employees in a household the higher the capacity to repay debt leading to the present consumption.

Looking at the age of the householder, the probability of debt possession decreased within the group above 45 years old. This is consistent with the analysis shown in Table 2, where the percentage of households with debt reaches a peak in the 35-44 year-old group and then gradually decreases.

Table 5. Estimated result of the main factors for the existence and non-existence of debt (Panel Probits)

Debt Possession Status Model		
	Marginal effects	t-value
Asset portfolio factors		
Real estate assets (billion won)	0.0078 **	2.29
Financial assets (billion won)	-0.1427 ***	-8.9
Social statistics factors		
Human capital		
Years of education of householder	0.0061 *	1.96
Expenses for education (billion won)	0.3285 ***	3.01
Number of household members		
Number of household members	0.0729 ***	7.24
Number of employed household members	0.0307 **	3.39
Employment status		
Paid labor	0.0621 ***	8.89
Entrepreneur	0.1429 **	5.94
Unemployed	0.0372	0.64
Age of householder(compared to below 35 years old)		
35 ~ 44 years old	-0.0062	-0.19
45 ~ 54 years old	-0.0521 *	-1.92
55 ~ 64 years old	-0.1527 **	-5.67
Above 65 years old	-0.2789 ***	-11.07
Income level factors (compared to 1st decile)		
2nd decile	0.0032	0.15
3rd decile	-0.0078	-0.32
4th decile	-0.0397 *	-1.91
5th decile	-0.0884 **	-4.3
Year dummy (compared to 2002)		
2003 dummy	0.0324 *	2.02
2004 dummy	0.0401 **	1.96
2005 dummy	0.0516 **	2.29
2006 dummy	0.0619 ***	3.06
2007 dummy	0.0661 ***	3.42
Sample size	14,241	
Wald $\chi 2$ (degree of freedom, p-value)	813.53 (22, 0.00)	

Notes: Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***.

Income level

Within the high income level (4th and 5th deciles), the likelihood of debt possession clearly decreased among all income levels. This is in contrast with the cross-sectional analysis shown in Table 1 in which the likelihood of having debt increases among the high income levels. This can be understood as meaning that need for debt among high-income household decreases when other conditions are controlled for.

From 2003, the year dummy showed had a positive influence on the likelihood of debt possession. The size of the coefficient increased in steps implying that the increase of real estate prices encouraged debt possession.

2) Analysis of the factors determining the scale of debt

Although real estate assets had a positive relation with the scale of debt, the scale had a negative relation with financial assets, in a similar way to that found for the analysis of factors determining the existence or non existence of debt.

Years of education of the householder and expenses for education also positively influenced the debt scale, as did the number of members and number of employees in the household.

However, the scale of debt decreased in the group above 55-64 years old. This contradicts the result of Table. 2, which showed an increased scale of debt up to the 64 years old group and decrease beyond that.

On the other hand, the income level did not influence the scale of debt. This is contrary to the basic argument that the income level affects the scale of debt through its impact on the capability to repay debt. Therefore, we carried out another analysis without controlling for real estate assets, looking at the residence status and real estate possession status excluding the main residence. We found an influence on the scale of debt in 4th and 5th deciles. This can be inferred to indicate that the effect of higher income level on real estate holdings was reflected in the analysis.

Table 6. Estimated result for debt scale factors (Panel Tobit)

Scale of Debt (billion won) Model				
	Panel model 1		Panel model 2	
	Estimated coefficients	t-value	Estimated coefficients	t-value
Asset portfolio factors				
Real estate assets (billion won)	0.0208 ***	11.15		
Residence status			0.0425 **	4.76
Real estate excluding residence			0.0568 **	5.81
Financial assets (billion won)	-0.1021 ***	-7.67	-0.0982 ***	-7.62
Social statistics factors				
Human capital				
Years of education of householder	0.0078 *	3.87	0.0136 *	4.83
Expenses for education (billion won)	0.4001 ***	3.52	0.3908 ***	3.21
Number of household members				
Number of household members	0.0551 ***	6.73	0.0506 ***	7.21
Number of employed household members	0.0298 **	2.79	0.0195 **	3.41
Employment status				
Paid labor	0.0361 ***	2.01	0.0321 ***	2.1
Entrepreneur	0.1691 **	6.98	0.1628 **	7.99
Unemployed	0.0908 **	1.81	0.0941 **	2.21
Age of householders (compared to below 35 years old)				
35 ~ 44 years old	0.0196	1.02	0.0191	0.91
45 ~ 54 years old	0.0068	0.4	0.0107	0.61
55 ~ 64 years old	-0.0629 **	-2.72	-0.0408 **	-1.82
Above 65 years old	-0.2307 ***	-6.65	-0.2254 ***	-5.74
Income level factor (compared to 1st decile)				
2nd decile	0.0059	0.29	0.0072	0.39
3rd decile	0.009	0.81	0.0121	0.79
4th decile	0.001	0.03	0.0197 **	1.89
5th decile	0.0401	1.13	0.0463 **	2.37
Year dummy (compared to 2002)				
2003 year dummy	0.0485 *	3.06	0.0457 *	3.11
2004 year dummy	0.0638 **	4.27	0.071 **	4.01
2005 year dummy	0.0709 **	5.02	0.0692 **	5.08
2006 year dummy	0.0981 ***	6.21	0.0992 ***	6.57
2007 year dummy	0.1121 ***	7.32	0.1097 ***	8.02
Sample size	14,241		14,241	
Wald $\chi 2$ (degree of freedom, p-value)	1243.03 (22, 0.00)		1348.4 (23, 0.00)	

Notes: Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***.

Conclusion

In conclusion, there were certain environmental factors including the low interest rate, financial deregulation, and constant increase in real estate prices, which led to the rapid increase in household debt in South Korea in the 2000s. As a result of these changes in the macro-economic environment, households accumulated asset with a precautionary motive utilizing real estate collateral for housing-related loans. As a result, household debt increased.

Categorizing by characteristics and tasks, a microeconomic analysis considering the characteristics of individual households found that real assets such as real estate had a strong effect on the possession an scale of debt.

Moreover, the proxy variables for human capital, which were level for education and expenses for education, positively influenced the possession of debt. Even though it seemed to show rational economic behavior following the life-cycle hypothesis, there were several contradictory examples, such as; the fact that the scale of debt increased up to the 64 years old group, Thus, more careful analysis is required.

Furthermore, the analysis showed that the income level did not affect debt when real estate assets were controlled for in the relationship between income level and scale of debt. This contradicts the explanation that the high-income households with large real estate assets tend to accumulate more debt because they have more collateral compared to the low-income households. Thus, more detailed study is required on the influence of real estate value in the 4^{th} and 5^{th} deciles, as shown in Model 2 where real estate assets were not controlled.

In addition, looking at tasks, as mentioned Chapter 3, the time series analysis for the macro economical factor, a detailed quantitative analysis and the relationship with micro economic factors remain as work for the future.

Notes

1) GDP-adjusted financial debt in 1997 was 82.1% a lower figure than the 100% recorded in the U.S and U.K, but higher than the 65% for Japan and 48% for France. Disposable adjusted financial debt is 148.1% at present, an increase of approximately 1.6 times from the end of 2007. This is higher than the figure of other OECD countries such as Japan (112%) and the U.S. (136%).
2) Percentage of household loans from bank is based on its use: 52.8% for house purchasing, 21.3% for consumption, 25.9% for other items, based on the presumption that, housing purchases occupy more than half of expenditures.
3) Pooled OLS has the disadvantage of not taking into consideration the household characteristic η_i which is not observed. As a result, it does not have the advantage of the panel model. Moreover, many fixed effect models have been applied to household data from Korea Labor and Income Panel study, but there may be errors because the time series analysis is only for six years.

References

Campbell, J.Y & G. Mankiw (1989), "Consumption, Income and Interest Rates: Reinterpretation of Time Series Evidence", *NBER Macroeconomics Annual.*

Campbell, J.Y. & G. Mankiw (1990), "Permanent Income and Current Consumption", *Journal of Business and Economic Statistics,* pp. 269-279.

Campbell, J.Y. (2006), "Household Finance", *The Journal of Finance,* Vol. LXI, No.4.

Carroll, Christopher D. (2001), "A Theory of the Consumption Function, With and Without Liquidity Constraints", *NBER Working Papers,* No.8387.

Crook, Jonathan & S. Hochguertel (2007), "US and European Household Debt and Credit Constraints", *Tinbergen Institute Discussion Paper,* TI2007-087/3.

Debelle, Guy (2004), "Macroeconomic Implications of Rising Household Debt", *BIS Working Papers,* No 153.

Hall, R. E. (1978), "Stochastic Implications of the Life-Cycle-Permanent Income Hypothesis: Theory and Evidence", *Journal of Political Economy,* Vol.86, No.6, pp.971-987.

Iwasako, T. (2003), "Household Portfolios in Japan", *NBER working paper* No. 9647.

Karasulu, M. (2008), "Stress Testing Household Debt in Korea", *IMF Working Paper,* 08-255.

Kim Woo-young & Kim Hyun-jeong (2009), "Analysis for Household Debt Decision Factor", *Institute for Monetary & Economic Research, BOK, Working Paper* 380(in Korean).

Lee Gye-hwa (2005), "The Status and Implication of Household Debt", *SERI Economy Focus* No. 56(in Korean).

Yoo Kyuug-won (2009), "Analysis of Household Debt in Korea: Based on Micro Data", *10th KLIPS (Korean Labor & Income Panel Study) Conference paper,* pp.569-592(in Korean).